Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE ANNUAL STATISTICS OF MANUFACTURES IN MASSACHUSETTS.

By Horace G. Wadlin.

A paper has recently been published by my friend, Mr. North, developing a line of argument offered by him before the Committee on the Census of the United States Senate, in which he forcibly takes issue with a proposed plan for obtaining, biennially, statistics of manufactures in the United States, which had been presented to the committee by Hon. Carroll D. Wright. With Mr. North's main contention I have nothing to do. The plan which he was opposing has, I believe, been modified. But in the course of his argument he makes certain criticisms upon the annual statistics of manufactures, as taken in Massachusetts, which seem to me unwarranted.

Let me say, at the outset, that I do not think the proposed enlargement of the official statistics at Washington which he was opposing is necessarily justified by the success of a similar plan within the compact State of Massachusetts; nor, on the other hand, do I think it essential to his argument to allege the failure of the plan in Massachusetts. I am particularly interested in the progress of statistical work in this State, however, and of this work I believe, and hope to show, that the annual statistics of manufactures are an important part. The subject is germane to the purposes of this Association, and therefore, in no spirit of controversy, I have the honor to present this paper.

A standard is set up by which the annual statistics may be tried. This standard is the census, and it is assumed that only a census, that is, a complete return from all establishments of every kind, can show industrial conditions in general; and as the annual statistics do not include all the establishments which have heretofore been included in the census, it therefore follows that they cannot measure such conditions. The standard proposed may be accepted, but not the assumption. On the contrary, I propose to compare the annual statistics with the census, and by this comparison to show their accuracy.

The measurement of growth or decline in our industries is one of the principal uses of the census. Now, if the census affords a correct measure, and we find that the annual statistics agree substantially with it, then the contention that the annual statistics are of equal value as a measure is sustained. Exact agreement, of course, is not expected. No two censuses taken at the same time over the same territory would absolutely agree. But I ought to show, and will show, that there is no material disagreement between the results obtained in the annual statistics and in the census of manufactures taken either by the Commonwealth or by the United States.

The Massachusetts census of 1895 shows an increase since 1885 in the aggregate value of goods made, amounting to 25.97 per cent. Computing the growth for 10 years on the basis of the annual percentages of growth or decline shown from year to year in the annual statistics of manufactures, we arrive at a percentage of 28.35. This is a variation of 2.38 per cent in a period of 10 years, or not more than twenty-four one-hundredths of one per cent per year, upon the average.

Again, taking the establishments which made returns for annual statistics in 1895 and selecting the returns of the corresponding establishments for 1885, and determining the percentage of increase from them alone, we have a percentage of 26.42* as against 25.97 shown in the census, a variation of forty-five one-hundredths of one per cent only.

Still again, taking the total value of goods made, as shown in 1895 as against the amount shown in 1890 by the United States Census, we find a percentage of decline amounting to 4.32. The percentage of decline shown by the annual statistics of manufactures, based upon identical establishments for which returns are comparable, is 4.60; a variation of twenty-eight one-hundredths of one per cent.

---

* *Statistics of Manufactures*, 1895, Introduction, p. xxi.

The increase in wages paid in 1895 as compared with 1885, by the data drawn from the annual statistics, was 34.95 per cent, and, as finally determined by the census, 30.90 per cent; showing a variation of but 4.05 per cent in an aggregate of nearly $200,000,000. The increase in stock used, by data from the annual statistics, was 22.80 per cent, and by the census, 18.34 per cent; a variation of 4.46 per cent in an aggregate of about $460,000,000.

In other words, if we had taken no census but had relied upon the annual statistics, the sum of wages paid in 1895 would have been placed at $198,936,969; and the census returns aggregate $192,970,059. As to stock used, the aggregate estimated from the annual statistics is $478,622,158; and by the census it was found to be $461,254,353. As to output, the estimate from the annual statistics is $852,872,643; and the actual census aggregate $849,807,302. Do not these comparisons establish the validity of the annual statistics as a basis for judging of the increase in the different elements?

By means of the percentages of gain shown in the annual statistics for 1890 and 1885, and using the State census figures of 1885 as a base, we estimated, nearly one year in advance of the publication of the actual census returns, the output for 1890 in Massachusetts at $880,614,364. The figures of the Eleventh United States Census, when published, showed $888,160,403; a variation of less than nine-tenths of one per cent.

In order to compare the results indicated by the annual statistics with the returns of the Eleventh United States Census for the leading industries in Massachusetts certain differences in classification must first be eliminated. In the classification employed in the annual statistics, following the plan adopted in the State census, the cotton industry is shown in two divisions, namely, "cotton goods," and "print works, dye works, and bleacheries," which should be combined in order to parallel the United States Census classification; and, on the other hand, with the value of "cotton goods" as returned in the United States Census should be combined the added value placed upon cotton fabrics in print works, dye works, and bleacheries in order to bring the industry into harmony with the items combined in Massachusetts.

The items "cotton, woollen, and other textiles," "mixed textiles," "worsted goods," and "woollen goods" as presented separately in the Massachusetts reports should be combined in order to parallel the aggregate woollen goods product of the Eleventh Census; and the item "wool hats" should be excluded from the census figures, as these are not included with woollen goods in the classification adopted in Massachusetts. From the value of "silk goods" presented in the United States Census the item "dress trimmings" must be excluded for the same reason. Some slight differences of classification may possibly still remain, but after the readjustments mentioned have been made, the figures will be fairly comparable, and for the State census of 1885 are as follows: —

Wool products [*]	$50,861,392
Cotton products [†]	77,305,940
Carpetings [‡]	5,992,668
Silk goods [§]	3,501,240
Aggregate, combined textiles	$137,661,240

In order to test the validity of the annual statistics as a measure of growth as compared with the census we may estimate the product of 1890 by applying to each of these totals the percentages of increase derived from the annual report. The results of this computation are presented in the following table in comparison with the figures from the Eleventh U. S. Census, and the variation noted: —

---

[*] Excluding carpets separately presented) and wool hats.

[†] Including print works, dye works, and bleacheries.

[‡] Textile carpets only.

[§] Excluding dress trimmings.

COMBINED TEXTILES — 1890.

Classification.	Estimated Product from Annual Statistics.	Product from Eleventh U. S. Census.	Variation. Gain (+) or Loss (—) in Annual Statistics.	Percentage of Gain (+) or Loss (—) in Annual Statistics.
Wool products *	$61,699,888	$63,976,966	— $2,277,078	— 3.56
Cotton products †	112,696,302	110,537,767	+ 2,158,535	+ 1.95
Carpetings ‡	7,495,100	7,275,009	+ 220,091	+ 3.03
Silk goods §	5,004,672	5,397,569	— 392,897	— 7.28
Total	$186,895,962	$187,187,311	— $291,349	— 0.16

* Excluding carpets (separately presented) and wool hats.
† Including dyeing and finishing textiles, added values.
‡ Textile carpets only.
§ Excluding dress trimmings.

In the aggregate, the value of product of the textile industry in Massachusetts for 1890, as estimated from the data derived from the annual statistics, was $186,895,962; the census returns show $187,187,311, a variation of $291,349, the estimate based on the annual statistics being sixteen one-hundredths of one per cent too small. The variations in the items shown separately in the table are greater than that shown in the aggregate, but, except with respect to silk goods, are in no case very great upon the percentage basis. In silk goods the variation is 7.28 per cent, partly due to differences in classification impossible to eliminate; but the product varies but $392,897, being on the one hand $5,397,569, and on the other $5,004,672.

We may apply the same test to two other leading industries of the State, namely, boots and shoes and paper. The total product of the first in 1885 was $114,729,533, and of the other $21,223,626. Applying to each the percentages of increase shown in 1890, as compared with 1885 by the annual statistics, we obtain the following estimates of product for 1890: Boots and shoes,[*] $135,954,497; paper,[†] $26,319,419. The United States Census figures are, respectively, $137,588,047 and $26,453,085. The variation is 1.19 per cent in boots and shoes, and fifty-one one-hundredths of one per cent in paper.

---

[*] Includes cut stock, findings, uppers, custom work and repairing, and factory product.

[†] Includes paper, envelopes, paper goods and stationery goods, not otherwise specified.

If, then, the census is set up as an accurate measure of the growth of the industries, as indicated by output, and the measurement of growth afforded by the annual statistics shows no material variation from that of the census, is it not certain that the annual statistics may be accepted as equally accurate?

These comparisons sufficiently show that the reports are not misleading, but that, on the contrary, they afford an exact basis of judgment; and therefore that the percentages drawn from them may be accepted as measuring the different elements relating to production.

The reason for this substantial agreement between the annual statistics, which include only a limited number of establishments, and the census, which aims to include them all, is not far to seek. It has been several times fully shown, but may now be repeated.

In the census of 1885, for example, the total product returned was $674,634,269. Of this product, goods to the value of $631,822,681, or 93.65 per cent, were turned out in only 6757 establishments, and in each of the other establishments, which swelled the aggregate number to 23,431, the value of goods made amounted to less than $10,000. Further, 88.96 per cent of the total product was made in 4406 establishments. In other words, the returns from 4406 establishments would represent 88.96 per cent of the total value of goods made as returned in the census; and if returns were secured from 6,757 establishments we should then cover 93.65 per cent of the industrial output of the State.

We should not only cover this large proportion of the output, but also include a correspondingly large proportion of the persons employed, wages paid, and stock used. And it is also certain that the inclusion of the other establishments would not materially change the relations of the different elements to one another, as expressed in percentages, or materially alter any deductions respecting our industrial conditions which are likely to be drawn from the returns. It is true that the conditions obtaining in the excluded establishments alone could not thus be measured, but, if these excluded establishments were included, it would not, I repeat, change in any material degree the relations of the different elements to one another, or affect any important deduction which could be made as to the condition of our industries as a whole.

If the establishments are graded in three classes,— low, medium, and high, classing as low, establishments in which the value of annual product, as returned in 1885, was less than $40,000; as medium, those returning an annual product of $40,000 but under $150,000; and as high, those returning an annual product value of $150,000 or more, it will be found that the percentages of increase in each grade vary; but, if the different industries are examined in detail, it will be seen that a practical uniformity exists in the percentages of increase in the medium and high grades, while those in the low grade exhibit a considerable variation. That fact is brought out by the census, and it is an important fact. But, if the returns from the medium and high-grade establishments only are taken, the percentage of increase derived from them is not materially different from that obtained when all the establishments are included. For example, the increase in 1890, as compared with 1885 in all establishments, was 27.70 per cent, and the percentage derived from the medium and high-grade establishments only was 25.68.* That is, to repeat, returns from the establishments graded in these last two classes will measure very closely the condition of the industries as a whole. The inclusion of the comparatively large number of establishments of low grade does not materially change either the aggregate results or the results in the ten leading industries of the State; and for that reason the returns obtained in the annual statistics are in substantial agreement with the results shown in the census.

---

* *Statistics of Manufactures*, 1890, Introduction, p. xxi.

It is not assumed that "the prosperity of the smaller establishments can be correctly inferred from the ascertained condition of the larger industries which are made to stand as typical." But it is clear that the condition of the industries as a whole, in Massachusetts, whatever may be the case as to the whole country, can be shown by returns from a number of establishments relatively small, but which include in the aggregate a product relatively large, as compared with the establishments and product usually included in the census.

The annual statistics are not confined to "the large, perfectly equipped and thoroughly organized establishments which run on from year to year, with little change in the output, piling up stock, or taking orders in advance of their capacity to manufacture." In fact, the large establishments fluctuate extremely from year to year, in their output, in their employés, and even in their capital, if by capital we mean the sum actually devoted to production. Some run more evenly than others, it is true; but the returns do not exclude the smaller establishments.

The distinction between the establishments included and excluded conforms approximately to that between strictly factory and shop industries. This line was roughly drawn in the State census of 1875 in the separation of the statistics of "manufactures" on the one hand, from those of "related occupations" on the other. In the State census of 1885 and subsequently, no such division was made, which largely accounts for the great increase in the number of establishments without a corresponding increase in product. The failure to observe this distinction complicates the collection of the data and the work of tabulation; enormously increasing the cost, and retarding the publication of the returns, without correspondingly extending the value of the census or materially adding to our stock of statistical information.

National censuses prior to 1880 excluded establishments having an output of less than $500 in the census year; yet of the large number of establishments returned in the State census of 1885, nine per cent were establishments of this kind, and nearly one-third of the whole number were establishments in which the aggregate product did not exceed $1500. Many of these establishments, like those included in the United States Census of 1890, were not in any usual sense of the word manufacturing establishments, although they were industrial establishments. They include large numbers of country carpenters, blacksmiths, wheelwrights, painters, plasterers, plumbers, milliners, and dressmakers, many of whom were working either by themselves or with but one or two employés. They include concerns operating under sidewalks, in cellars, lofts, and attics, without machinery, without capital, consuming little, if any, raw material, adding nothing important to product. They include bottlers, who simply take liquor in bulk, and, adding nothing, put it up in bottles with a new label. They include cobblers who do not make shoes but simply re-bottom them. They include, or at least did include, until omitted by Mr. Porter in the middle of the canvass of the Eleventh Census (a precedent followed by the Massachusetts census office in 1895), dentists, who do nothing but set artificial teeth in plates; —but it is not necessary to multiply instances. None of these, except by a special use of the term, would be called "manufacturing establishments," but have been thus classed in the Massachusetts Census of 1885 and in the Eleventh Census of the United States.

The results of the State Census of 1895 might have been published some months ago but for the inclusion of establishments like these, which we did not think it advisable to omit, inasmuch as they were previously included. But in presenting the results we shall endeavor to classify them separately, to an extent at least, so as to enable discrimination to be made in future censuses without disturbing comparisons with the past. Whether we have in the aggregate 26,923 establishments in Massachusetts, as reported in the Eleventh Census, or 23,431, as reported in the State Census of 1885, or a much smaller number, depends altogether upon how many concerns of this kind are included. After we pass the $10,000 limit of product we enter directly upon this field. All of these concerns have never yet been enumerated, and many of those included have no books of account, and therefore estimate the required items from more or less fragmentary data.

I find my opinion as to their exclusion from the census of manufactures supported by the late General Walker, when, in speaking of the defects of the census law, in the remarks on the tables of manufacturing industries in the Ninth Census, he states that fully one-fifth of the cost of the census had been expended for returns relating to such establishments, and even then the returns were extremely unsatisfactory. "The money thus thrown away," he says, "would have served . . . to make the statistics of the larger industries complete and correct in the highest attainable degree, creditable to the census as a national work, and invaluable to the statesman, the political economist, and the practical man of business. . . . In a word, *the returns of manufactures should be restricted to those industries which are carried on in considerable establishments, and are susceptible of a thorough, complete, and detailed enumeration.*"* Whether or not the census should be thus restricted, however, is not pertinent to our present inquiry. At all events, it is clear that, if it be thought advisable to include industrial establishments of the kind mentioned, if properly classified by themselves, they do not materially affect the results or change in any important degree the deductions that may be drawn from the census. So far as they affect results at all, they vitiate conclusions by introducing elements entirely dissimilar to those which exist in establishments of the other class.

The annual statistics include the establishments which employ the bulk of the operative classes. For example, the average number of persons employed in 1895, by the census, was 432,272; and the average number employed in 1895, by the establishments put into comparison for annual statistics for the years 1895 and 1896, was 307,590, or 71.16 per cent, nearly three-fourths of the average number in the State. A larger number was actually covered but not used in the comparisons because the establishments were not represented in each of the years. Nor do the annual statistics neglect the new establishments. On the contrary, they are carefully noted, and finally take their place in the yearly comparisons. As a matter of fact, I may state that the enumerators of the population as a part of their duty returned to the office a list of all establishments, of whatever kind, engaged in manufacturing, and only a comparatively small number of them had not been noted previously by the Department.

---

* *Ninth Census of the U. S.*, vol. iii, pp. 384–385.

The validity of the annual statistics being established by the standard set up, namely, the Decennial Census (and other illustrations will be given later), it will, I think, be plain that they afford a basis for determining *present* conditions; that is, conditions in the different industries at the time the returns are made. They are not expected to measure conditions as they exist at the end of ten-year periods; that is the purpose of the census. But they do afford reliable data as to conditions from year to year; and, really, that is all that has ever been claimed for them. And I do not mean data relating merely to the increase or decrease of the industries, but as to all points for which we are otherwise obliged to rely upon the censuses taken at intervals of ten years. For, although, as I have said, the census is used as a measure of growth, it is also of value in the statistical determination of important social questions relating to employment, to wages, to the relative preponderance of the sexes in the industries, to the relation between wages and product, and to other subjects, some of which are purely social, some economic, and others economic-social, if I may use that term. The conditions affecting all these are continually changing from year to year, making the annual statistics of special value because they reflect immediate conditions much more perfectly than the census.

It is perfectly true that individual manufacturers do not "predicate business operations upon statistics of this character;" but it is not a valid argument that such statistics are worthless to manufacturers because no individual can draw from them conclusions which bear directly upon his own operations, nor that a manufacturer, who may never have had occasion to use them personally, may think them worthless. Similar objections are sometimes urged against the collection of census statistics by those who, for the moment, are disinclined to take the trouble, usually much magnified in their minds, to fill the required schedule. But the annual statistics, equally with the census, have a direct practical value in connection with subjects that are constantly brought forward relating to the condition of our industries, involving inquiries which are frequently made by manufacturers upon matters relating to their interests, but which are by no means confined to manufacturers.

There is constant inquiry from the public, from legislators, from writers upon economic subjects, from students of economic questions, from persons employed in the different industries, from boards of trade interested in the growth of different localities in the State, from the press, from manufacturers seeking general information for *present* data respecting the industries. Information, for instance, may be requested as to wages or earnings. What is wanted are not wages or earnings six, eight, possibly nine, years ago, but present wages. How do they compare with output? What relation do they bear to persons employed? Suppose, for example, average yearly earnings are desired for the industries already referred to, and the question is asked in 1895,— what answer is afforded by the annual statistics?

It is given in the following table for the five leading industries in comparison with the figures from the census:—

AVERAGE YEARLY EARNINGS.

Industries.	Annual Statistics, 1895.	Census, 1895.
Cotton goods...........	$328.77	$330.24
Woollen goods.........	370.99	368.14
Worsted goods........ .	365.17	363.52
Paper and paper goods	405.57	408.22
Boots and shoes........	482.60	472.62

Note the correspondence of the figures. If the annual statistics are as trustworthy as the census in this year, why not in any other year?

Suppose, to carry the illustration in this direction still farther, we are passing through an industrial depression affecting output, employment, earnings; all of which topics are then of vital public interest. On these points, as affected by the conditions which then exist, the census affords no light. This deficiency can only be supplied by a return made at the time.

Suppose, too, that the census year happens to fall before the wave of depression has spent its force, and all the ten-year measurements of growth must be based upon returns taken in a year of great depression as against those made in a year of prosperity. Are not the deductions sure to be misleading? This, of course, is admitted, but the point is raised that the annual statistics afford no standard by which the effect of the depression may be measured. I think it is clear from what I have said that the fact is otherwise, and that the full effect of the depression, its relation to the normal output of our industries, its effect upon employment and wages, can be shown either graphically or by figures, and that thereby certain things, which, when the census of 1895 is published, would otherwise appear quite inexplicable, may be fully and fairly explained.

It is true that to an extent "its record is found in various trade data and in the reports of certain newspapers," but no complete statement as to any single industry can be made from such information however complete any part of it may be in itself. The facts come from different sources; they have no direct relation to one another. Where, for instance, can we find, or from what source compile, any fair statement of the output of the different industries of Massachusetts during the present period? How determine the fluctuations of employment or the course of wages? I do not mean for particular industries, but over the whole field. Yet these are instances of the kind of information that is demanded. The condition of our industries is not shown in this way by newspaper reports, and if it were, no newspaper reports can take the place in validity and authority of official statistics, regularly collected and carefully analyzed.

And I think it is worth something historically to have authoritative data, showing the course of industrial conditions through a series of years, carefully compiled from original sources, upon substantially the same basis from year to year. The plan adopted in the reports upon the annual statistics is to compare the returns of two successive years, and to use in these comparisons only those returns which are made from identical establishments in each of the years compared. This makes it certain that the results will be drawn from returns made upon the same basis in year, and at least free from the introduction of dissimilar elements which so frequently tend to vitiate comparisons and render them misleading. This is a step toward accuracy at the source and must of itself make the results more trustworthy.

The returns thus afford data from year to year as definite and exact as the census returns themselves. They do not, it is true, give us exact numerical totals over the wide field covered by the census, although, as we have seen, such totals may be closely estimated from them; but for comparisons and relative statements or deductions based upon percentages they may be accepted without question; and it is this use of statistics that is most important. To say, for example, that there were 496,920 persons in Boston in 1895, as against 448,477 in 1890, does not of itself mean much; but to say that the increase has been 11 per cent, or a gain of 11 persons upon every 100, within this period makes a distinct mental impression. To say, similarly, that the increase in the output of cotton goods in 1895, as against 1894, is 10 per cent is the important fact; the numbers upon which the percentages are based are comparatively unimportant. And if this and similar facts can be determined by the annual statistics within a reasonable degree of accuracy, they are, so far, as valuable as if determined from a census.

Take, as another illustration of what I mean, two or three of the more common statistical comparisons that are drawn from the census, such as the percentages of industry product (by which I mean the value of product created in the industry after deducting the value of stock and materials used) paid in wages, devoted to profit and other expenses, and the percentage which this last portion of product constitutes of capital invested. Such comparisons are made in the following table for the five leading industries in Massachusetts, the percentages derived from the annual statistics and from the census being placed in parallel columns: —

Industries.	Annual Statistics — 1895.			Census — 1895.		
	Percentages of Industry Product —		Percentage of Profit and Minor Expense Fund of Capital Invested.	Percentages of Industry Product —		Percentage of Profit and Minor Expense Fund of Capital Invested.
	Paid in Wages.	Devoted to Profit and Minor Expenses.		Paid in Wages.	Devoted to Profit and Minor Expenses.	
Cotton goods	60.49	39.51	14.76	60.75	39.25	15.04
Woollen goods	57.08	42.92	20.53	58.25	41.75	20.50
Worsted goods	60.15	39.85	18.95	60.06	39.94	19.13
Paper and paper goods	46.32	53.68	22.18	47.48	52.52	20.84
Boots and shoes	60.61	39.39	58.44	60.33	39.67	59.61

Here it will be seen that the results are in extremely close correspondence, showing, of course, that the small variations between the aggregates estimated from the annual statistics and those derived from the census do not affect such comparisons, because the variations in each of the elements, *i. e.*, capital invested, stock used, goods made, and wages, have equal force, so that the conclusions as to the relation of wages to industry product or of the profit and expense fund to industry product, or of the latter to capital, are equally exact and are not materially different whether based upon the information derived from one source or the other.

The plan of basing conclusions upon a limited number of similar cases is by no means new, and, indeed, is universally accepted in statistical investigation. Witness, to take an important example, the crop return of the United States. The accuracy of the results does not depend upon the number of cases included, but upon the fact that the cases included are typical; and this is to be determined by the results when measured, if possible, by some absolute standard outside themselves, or by results obtained over the same field in a parallel investigation. In that way I have tested the annual statistics in Massachusetts. Such annual returns do not constitute a complete census. That claim has never been made for them. A census has its uses, obvious and established, which need not be enlarged upon here. They also have their uses, which I have sufficiently presented. Each method of inquiry supplements the other, corrects its defects, and enables us to make the necessary allowances that almost all statistical documents demand before their conclusions can be accepted. The annual statistics in Massachusetts have thus far abundantly shown their usefulness, and they are certain to improve. The returns of the last five years in many of the industries are much more exact and satisfactory than during the first five years, and they will inevitably gain in fullness and accuracy.

I should be sorry to be obliged to support every statement that may have appeared from time to time in these annual reports. Frequently statements seem warranted that subsequent investigation will not sustain. The work was new when undertaken in 1886, and it would be strange if some mistakes had not been made in plan and in arrangement.

Some industries, from the exigencies of the case, have been treated more fully than others, with correspondingly satisfactory results. During the first five years the boot and shoe industry did not receive the attention its importance demands, only about 33 per cent of its product having been covered. But since, with the greater efficiency resulting from permanance and experience, it has been brought up to the position of the other leading industries. Brevity of time, the pressure of other work in the Department, and due regard to economy have forced the office to compare a fewer number of schedules in some years than in others. These considerations have also influenced the date of publication of the reports, which, however, have gone out within a few months after the schedules were received from the manufacturers, except when the Department was burdened with the work of the Decennial Census, obliging us to delay publication. This, however, is rapid work, when it is borne in mind that the collection is not undertaken until after the close of the year, in order that the record of the previous twelve months may be fully made up in the establishments, and when the convenience of the manufacturer is consulted by the office, which has always proceeded upon the theory that no one should be harassed or unduly pressed in this matter.

The success of the reports has been largely due to the coöperation of the manufacturers who have, as a rule, cheerfully complied with the statute under which they are prepared, and the Department aims to reduce the labor or inconvenience of making the return as far as possible by simplifying and condensing the inquiries, and otherwise. If the manufacturers could file the schedule in the office by February 1st, the reports might be issued in April. But, as in the collection of census returns, considerable latitude must be given, and properly given, under the circumstances.

I regret the controversial tone this paper seems to assume in parts. I have neither time nor taste for controversy over figures; but I think it essential that the real value of the annual statistics of manufactures in Massachusetts should appear, and, I am sure, Mr. North desires nothing more.

Remarks by S. N. D. North.

By Mr. Wadlin's courtesy, I have had the privilege of examining his paper on the *Annual Statistics of Massachusetts*, in reply to certain criticisms incidentally made in the December (1897) *Bulletin of the National Association of Wool Manufacturers.* Like Mr. Wadlin, I have no desire to discuss the question in any controversial spirit; but both of us will welcome any discussion which may possibly promote the scientific value of the statistical work of the government, state or national. The importance of the question now raised is obvious; for if the plan of collecting annual statistics of manufactures in vogue in Massachusetts is as valuable and advantageous as Mr. Wadlin believes it to be, it should not only be extended to other states, but made the basis of a radical change in the methods of collecting and presenting this class of data. If, on the contrary, it seems open to serious criticism, the nature of that criticism should be carefully examined, and the practical utility of these annual reports definitely determined. To that end, I venture to make the following comments upon Mr. Wadlin's paper.

My original criticism upon the Massachusetts annual statistics was two fold; — first, that they do not afford an accurate standard by which to measure the industrial growth of a community or commonwealth; and, secondly, that, failing to do this, they do not accomplish any other practical purpose sufficient to warrant their constant compilation. Further study of the question, with Mr. Wadlin's paper before me, convinces me that both propositions are sound.

The last annual report of the Bureau of Statistics of Labor shows 4609 establishments covered for the year 1895, making goods to the value of $569,097,021; whereas the decennial census of that year, embracing presumably 26,000 establishments (Mr. Wadlin does not state the number), produced goods to the value of $849,807,302. In other words, by covering one-sixth of the establishments of the State, he secures two-thirds of the total product; and his contention is, that this is so large a proportion of the total product as to make the data presented a safe and correct criterion for judging the present condition of all the establishments of the State. We may concede, with certain limitations, the soundness of that contention, so far as it relates to the eight or nine leading industries. At the same time, I do not hesitate to affirm that a more satisfactory and a more scientific result would accrue, if the Bureau of Labor Statistics were to pick out three or four leading industries, say cotton, wool, boots and shoes, and machinery, and present for each of these a complete annual report, leaving the status of the other industries to be judged by the status of these typical groups. So far as the record went, it would then be a record of growth, and, as an index of business conditions, it would possess decided advantages over the method now in vogue. So far as it went, it would be an absolute standard of measurement; and many of the uncertainties, perplexities, and limitations which continually confront and annoy the student of the present annual reports would be eliminated. While I question the necessity for any annual returns, I believe that if they must be had they should be made in the manner that will make them the most generally useful and the most easily understood. As the reports are now made, they have too many of the characteristics of a mathematical puzzle.

Mr. Wadlin makes it clear that our census methods of reporting manufacturing statistics confound two things which are not at all alike, and the grouping of which in the same series of tabulations is not strictly scientific; — the factory manufacture and the shop manufacture,— as we may call it for lack of a more definite designation. The conditions which govern production in the two are certainly not the same; and we may hope that a time will come when it will be possible to properly differentiate them in both state and federal censuses of manufactures. To so differentiate them appears to be a large part of Mr. Wadlin's plan in this branch of his work. Heartily approving of the idea, the question remains whether his method is the one best adapted to that purpose.

In the first place it is a departure from the purpose for which the annual statistics were originally authorized by the legislature. The law of 1896 under which the annual statistics are taken did away altogether with the decennial census of manufactures. The language of the first report under that law leaves no room to doubt that it was the original intention of the Bureau of Labor Statistics, as well as of the law makers, to make the annual account a complete although abbreviated substitute for the decennial census of manufactures. Mr. Wadlin says that he has not seen his way clear to abandoning the enumeration of the minor industrial establishments,— the shop, semi-professional and hand industries omitted from the annual account; and, hence, when the time came, the decennial census of 1895 was taken as before. Clearly, therefore, the original purpose of the annual account — to do away with the decennial census — has failed. We are to inquire, then, whether there are other purposes sufficient to warrant their continuance; whether the annual account is a satisfactory presentation of the factory industry as distinguished from the shop industry; and whether there is any secondary purpose served important enough to justify the State in requiring so large a body of manufacturers to make not only an annual report, but, every fifth year, two reports of their year's business.

In the report for 1887 it is stated that the purpose of these statistics is "to ascertain whether or not the volume of production is keeping pace with the past, and to determine our industrial condition from year to year."

The first of these two purposes cannot be satisfactorily accomplished so long as there is a constant variation in one of the main factors of comparison and no record of the actual increase or decrease in that factor. I refer to the number of establishments considered. The comparison of identical establishments, from year to year, determines the relative condition of these identical establishments in the two years. It indicates whether their production has been greater or less in value. Mr. Wadlin adds that an elaborate system of percentages carried over from one year to another will ascertain with close approximation the actual growth of any industry or of all the industries of the State, between any two given years, with a decennial census as a starting point. He apparently demonstrates this by numerous examples, comparing 1885 and 1890, and 1890 and 1895. But these examples are nothing more than curious and interesting coincidences. No percentage calculated upon certain fixed and given things, such as a group of identical establishments, can be a reliable percentage for calculating certain other and different things not within purview. The accidental coincidence may frequently appear; but the procedure is none the less an hypothesis. Mr. Wadlin's figures are based on the assumption that the product of new establishments started in any year, or others discontinued in that year, is directly proportional to the increased product, or the decreased product, of the establishments continuing to do business and reporting to the Bureau. If the figures seem to justify the assumption, it can only be described as an instance of remarkable good luck on the part of the Bureau; for, in the nature of things, there can be no such actual relationship.

This fact can be illustrated by the cotton manufacture. There is much interest today to know how this industry stands in Massachusetts as compared with its position in 1890. I cannot ascertain from the annual statistics. The relative spindle capacity at the two epochs is not given. The actual number of mills in operation at the two epochs is not given. In the first year reports are presented from 157 mills producing goods worth $90,063,203. In 1896 the reports are for 169 mills producing $87,146,004 worth of goods. These 169 establishments are employing $112,902,817 capital in 1896 as against $115,474,265 employed by 157 mills in 1890. Has the capital employed by our cotton mills decreased by that amount in the five years? From the increase in mills it should have considerably increased. The value of cotton goods made in the State should have increased for the same reason, after making all allowance for the decrease in the market value of goods which has occurred in the interim. On the face of the figures it appears here to be about $3,000,000 less than in 1890. On their face, at least, the figures are misleading, and any attempt to get at the real fact by a resort to percentages of increase and decrease, based upon the returns of a constantly varying number of mills, is hopelessly confusing, uncertain, and untrustworthy. In a word, the statistics do not enable us "to ascertain whether or not the volume of business is keeping pace with the past." The reason why is that there have been a number of new mills established in the State since 1890, largely increasing its producing capacity; what relationship these new mills bear to the problem, in the comparisons between 1890 and 1896, we are unable to determine. In any comparison between the two years, based upon identical establishments, they clearly cannot figure. The difficulty is that in both years we have not an absolute but a relative standard, this relative standard varying from year to year not with the actual variation in the number of mills in operation, but with the variation in the number of mills compared. Percentages in the compilation of which these accidental variations have so much to do are dangerous, to say the least. That Mr. Wadlin himself is of this opinion, I judge from the recent *Bulletin* on the cotton manufacture. The *Bulletin* is an admirable presentation of the statistical status of the Massachusetts cotton industry; but it entirely overlooks the phase of the subject we are discussing,— the most important phase of all. If Mr. Wadlin could ascertain the fact from the annual statistics, and demonstrate it therefrom, I think he would not have omitted to do so.

The *Bulletin* in question presents from the annual statistics the details of the cotton manufacture of Fall River, New Bedford, Lawrence, and Lowell so far as the office had the returns of identical establishments for the years 1890–1897. They are confined in New Bedford to nine mills, and they indicate that the nine mills in question made in 1897, $9,338,283 in products as against $8,841,869 in 1890. That is interesting and important. But in the meanwhile there were 18 cotton mills in New Bedford in 1897, and the system of comparing identical establishments compels half of them to be left out of the account. In other words, the annual statistics are not *a measure of growth*, and, therefore, they cannot accomplish the first of the two objects which Mr. Wadlin has assigned to these compilations. No system of computation based upon identical establishments, and those only, can be a measure of growth, except as to the growth of those identical establishments.

Nor is it a successful answer to this criticism to say that "the plan of basing conclusions upon a limited number of similar cases is universally accepted in statistical investigation," and to instance the crop returns of the United States. Indeed, the illustration is fatal to this contention. Any estimate of the year's wheat crop, based only upon the average yield per acre, as compared with the average yield of the previous year, would be fatally defective. It must also take equal cognizance of the actual increase or decrease in the acreage. Crop estimates are based upon these two elements. Mr. Wadlin's estimates, which should also be based upon two elements, take cognizance of but one. They compare the relative production of identical establishments, but they take no cognizance of actual increase or decrease in the productive forces of manufacture.

As to the second purpose of these statistics, above stated, "to determine our industrial condition from year to year," the utility of the annual statistics is not so much a statistical as a practical question; and opinions may differ widely. That Mr. Wadlin is convinced of their great practical value I have no doubt. That we can learn some things from them of interest, I admit. Whether the things we learn in comparison with the things we would like to learn but cannot are worth learning every year, is a fair question.

The annual fluctuations reported in the amount of capital employed are of no value or significance. As capital is reported, either to national censuses or the Massachusetts annual reports, it is a valueless contribution to statistical data, including as it does borrowed money and the raw materials purchased with borrowed money, and varying as it must according to the exigencies of the particular period when the report is made. If the returns of capital are valueless, the annual calculation of "percentage of profit and minor expense fund to capital" is valueless; and the variations in this percentage which occur from year to year are of no moment or statistical significance.

Variations in the value of gross product from year to year are due wholly to two causes: first, variation in quantity of output; second, variation in market value of output, *i. e.*, prices. The annual statistics of Massachusetts take cognizance of neither of these two elements. To actually accomplish the purpose of showing "the trend of business from year to year" they must necessarily take cognizance of both. The "trend of business" can only be statistically shown by showing the relationship of volume and value from time to time. Since the annual statistics cannot do this, in the nature of things, we question the practical utility of an annual report on the part of the State showing value alone; because value alone cannot accomplish the end sought, and the items omitted are the elements whose presence is absolutely necessary to form correct conclusions from the figures which indicate value.

This criticism applies equally to many of the subsequent calculations made in the summary analyses of the reports.

The value of the "stock used" varies from year to year, not simply with the output of goods, but with every fluctuation in the prices of raw materials.

The "industry product" varies in value in keeping with the variation in prices of two absent elements, *viz.*, the prices of goods and the prices of raw materials; and the percentage figures of the reports are thus vitiated from both ends.

When we come to "the relationship of wages to value of gross product" we have a series of fluctuating percentages which are assumed to indicate what proportion of the total value of the proceeds of industry goes to the wage earners in each year as compared with the prior year, but which in reality do nothing of the kind. The fluctuations are sometimes quite wide; in the cotton manufacture they vary from 55.41 per cent in 1888 to 70.19 per cent in 1896; and as between the several industries they vary (in 1896) from 47.52 per cent in paper and paper goods to 70.19 in cottons. These percentages of course largely depend, as between the different industries, upon the relative cost of the raw materials employed to create a given product. Their variations are chiefly determined in identical industries by the varying prices of raw materials and finished goods. Their significance it is hard to see, and their only effect must be to mislead. They are not in any way indicative of a change in wages. They do not prove a larger or smaller margin of profit, because they are based upon too many elements of variation. They can indicate nothing which throws any light upon "the trend of business" or the relations of labor and capital, or anything whatsoever. They may possess a certain interest for the curious, but their calculation and presentation year after year, as though they were in some sense a factor in reaching definite conclusions as to business conditions, or were of intrinsic statistical or sociological significance, is not only not justified, but ought, in my judgment, to be condemned and stopped, as tending to promulgate error. Any theory of business conditions, either by the business man or the statistician or the doctrinaire based upon these annual fluctuations in the percentages of "industry product paid in wages," is certain to be misleading, because they have no relationship to any causes or conditions of which the report takes cognizance.

It would be easy if it were worth while to carry these criticisms to many other similar calculations and percentages contained in the annual statistics. Enough has been said to show that the annual statistics (1) are not a substitute for the decennial census of manufactures; (2) that they are not a safe measure of industrial growth; and (3) that they are not a true guide to "the trend of business." In asserting all this, I do not wish to be understood as denying that interesting and important facts are brought out in these annual reports; but I raise the broad question whether the State of Massachusetts has adopted the best method of rectifying the criticism upon decennial censuses of manufactures, which springs from the fact that one may be taken at a period of great prosperity and another at a period of great business depression, and comparisons between the two may thus be greatly misleading. The true remedy, I believe, is the quinquennial census of manufactures by the state or the nation, or by both in coöperation. Intervals of five years are sufficiently close together to meet the criticism above mentioned. Five-year periods are as frequent as it is necessary or desirable to gather such statistics. The fluctuations that occur in wages, in numbers of employes, in product, when measured by five-year periods, will accomplish all the statistical, economic, and sociological purposes which the Government has in view in authorizing this class of investigations. Mr. Wadlin says that there is a constant and increasing demand for *present* data on all these points. I agree with him as to the importance of early availability for such statistics. But I believe him entirely mistaken in supposing that there is any real advantage to knowledge, to society, or to industry in serving them up every year and thus indefinitely multiplying the points of comparison. There is as much danger of too many statistics as of not enough. They may become confusing, perplexing, and superfluous.

To secure the highest utility for the statistical work of the Bureau, Mr. Wadlin might well consider the advisibility of substituting for the annual reports a new five-year inquiry midway between the decennial censuses, and confined to the actual manufacturing establishments of the State as contrasted with the shops. He informs us that he has already so systematized his work that it would be possible to make exact comparisons with the similar establishments reported in the larger work. From such five-year censuses it would be possible to measure the actual industrial growth of the State, abandoning all this elaborate series of percentage measurements, and comparisons of identical establishments, and presenting all the data regarding wages, product, etc., which is now repeated annually, in a manner that would amply satisfy the requirements of statistical science and sociological inquiry.

S. N. D. NORTH.

Boston, Mass.